BCDA Activities – May 04

Highlights

J. Sullivan attended the Spring '04 EPICS collaboration meeting.

Made improvements to the motor record and to handshaking between the sscan record and saveData to make large improvements in step scan efficiency (see below for details).

Members of the group attended all, or selected parts, of the APS user conference.

Specific beamline/XOR support

XOR-1ID:
- Designed and tested 1idc "pseudo motor" support. This uses real motors driven by a transform record, with a soft motor on top.
- Re-configured slits support for JJ slits, which drive the slit's aperture and center directly.

XOR – 2
Tomography
- Modified the tomography parallel processing cluster to export intermediate calculations when requested. These intermediate calculations can be a great help when troubleshooting the cluster.
- Discussed strategic planning for tomography system upgrades and settled on a roadmap for future development.
- Troubleshot a problem with occasional reconstructed slices having low contrast. We could not reproduce problem with the current code. We think the problem is related to a known bug that existed for a few days last run. We're looking into exactly when these sets were reconstructed to see if it was during the few days time we know we had a problem.

Other
- Worked with Stefan Vogt to reduce motor related delays in small-step size scans, which resulted in "an increase of ~4% beamtime".
- Investigated OMS58 related bus errors at ioc2ida. No results yet.
- Installed a new feature at the request of Barry Lai from 2IDD, to display images with a Log scale which should be able to display the weaker signals in a image. In many cases the default IDL linear color table does not display the weaker signals clearly but sometimes the user needs the option to display the image with more color contrast .
- Debugged a problem encountered by 2IDD in running scanSee 2D.
- Deployed glue electronics box to drive Struck MCS enable and channel-advance from several motors, at 2xfm.

XOR – Sector 4
- Upgraded ioc4idc1 to synApps_4_6, the latest 3.13 release of synApps. Resolved several unanticipated configuration and compatibility problems.
- 4idc workstation had a problem accessing the newest version of scanSee.R3.2 and catcher.R3.1. It was discovered that their graphic device had a number of colors less than 256. Suggested that they should have their work station upgraded, otherwise they will have screen flashing problem.

MU – Sector 6
- Worked with Doug Robinson to get him a viewer to view raw data from the Topology lab.
- Worked with Philip Ryan to explain how the CCD Image Server works and pass on some experience about using the Quantix CCD camera from Photometrics.
- Tested a questionable OMS board to verify problems that were seeing.

MHATT – Sector 7
- Met with Dohn Arms to discuss possible solutions to some motion controls problems they are having.
- Received "MHATT-CAT EPICS Configuration" document from D. Arms, in order to become more familiar with their control system.

IMM – Sector 8
- Talked with IMM about potential ways to parallelize their data processing. A plan has been devised and discussed with several interested parties.
- I Station
  - All remaining devices were integrated into ioc8idi1 during the May/June Shutdown. Those included...
    - XIA Filter (Digital I/O)
    - MM3000 motor controller
    - MDrive17 motor controller
  - The I-Station has been turned over to the beamline scientist (A. Sandy) for final setup and testing.

- D Station
  - Implemented EPICS access security on slaved mmonochromator motors to prevent accidental damage to stage.
  - Created a Motor Status Update system (database and MEDM screens) that uses the STUP field in the motorRecord. This allows for dynamic tracking of an encoder value that is not being used to 'close-the-loop' on a motor.

- EPICS Gateway integration
  - All the Sector 8 user workstations were attached to the EPICS gateway network drive through /usr/local/epics
  - All the experimental USERS profiles were modified so that EPICS client

- o applications are run off the gateway installation of /usr/local/epics/extensions'
- o The Linux version of the IDL virtual machine was installed on the EPICS
- o gateway (/net/helois/epicscat/gateway/rsi) and the Sector 8 workstations were attached
- o to it through /usr/local/rsi.
- o Working with Ben-Chin the IDL virtual machine version of her data visualization
- o programs were tested and worked on the Sector 8 workstations.

- • SoftMotor Database debugged.
  - o The softmotor database was found to be broken under 3.13.5 and later releases
  - o of EPICS. The retargetable links did not restore their values after a reboot.
  - o Worked with T. Mooney and R. Sluiter to fix the problem.

- • Slit Database Development.
  - o Modified Slit database to allow for better integration with SPEC. A softmotor
  - o had to remain synced with Slit database and physical motors when they
  - o were moved independently. Tied NTM field (motor) to Slit database
  - o 'Moving' flag so that the physical motor backlash moves did not cause
  - o the SoftMotor to abort move.
  - o Created a version of the Slit database that would operate a stage
  - o with GAP and CENTER motors instead of LEFT and RIGHT blade motors.

- • MM3000 motor driver debugged.
  - o Several problems with the MM3000 motor driver (motorRecord) showed up when
  - o tested on a servo motor (in Sector8 I-station). Worked with R. Sluiter to
  - o fix these problems. (ie Torque DISABLE/ENABLE did not work)

CMC – Sector 9
- • Upgraded 9bma and 9bmb to synApps_4_6 from the gateway.

BioCARS – Sector 14
- • Consulted with Ning Lei on run-time programming

HP – Sector 16
- • The "motor record closed loop bug" at HP-CAT was resolved by upgrading to motor record release R4-8.
- • Upgraded two of HP-CAT's IOC's to build and (to some extent) run from synApps R4-6 on the gateway. Made several modifications to synApps R4-6 on the gateway (all documented in the synApps_4_6/README_patch file) to support the GATEWAY environment variable. GATEWAY is used to accommodate each CAT's unique mount path to the gateway filesystem.

BIO – Sector 18
- Completed testing of the modifications to the "Servo Tester". This is logic added to the circuit to cut off the motor drive current upon limit switch activation.

GMCA – Sector 23
- Designed a Lemo interface to the Joerger VS64 (32 channel version) using the existing IP-Lemo interface board.
- Ported devScaler_VS (device support for Joerger VS Read-on-the-fly scaler) and required modifications to the scaler record, to EPICS 3.14. Delivered alpha versions of the synApps 5.1 modules required to implement the new device support to Sergey Stepanov (GM/CA CAT).

NanoCAT - 26
- Several meetings to discuss and come up with a proposal for a control system to integrate the nanoprobe into the NanoCAT control system. Once the details get fleshed out a little more, the results of these meetings will be presented to a larger audience for comments.
- Compiled and passed on information about expected controls needs/costs for the NanoCat beamline (minus the experimental station)

XOR/XFD Support
- Helped Felix Krysnicki with several issues relating to data acquisition and conversion
- Fixed some problems in Leutl
- Upgraded test ioc in L1128 (M. Erdmann) to synApps_4_5. Implemented and tested a 2-motor coordinated tilt control based on the table record.

General

Upgrades to CCD Image Server
- Support for multiple images in a single Binary file.
- Support for IMM data compression algorithm. This algorithm uses the RMS calculated from a number of dark images to create a threshold used to determine if there was a photon event. Photon events are then recorded in an indexed list prior to being written to disk. In images with sparse data, this significantly reduces the file size.

Access Grid
- Installed AG onto a couple of machines.
- Got an AG server running and played around with AG internal to the laboratory.

- Spoke a couple of times with the AG people—they will come over in the coming weeks to discuss possible EPICS integration into AG.

eBrick
- built and tested asynDriver support for the eBrick. Currently having some performance issues, but I have been able to use all serial ports for communication.
- Ran ioc from FALSH IDE disk
- Working on replacing telnet with SSH

Wrote feature sheets for beamline hardware documentation database.

Ordered VIPC626 ip-carriers, and several ip-unidig boards.

Installed and tested the newest catcher.R3.1 and scanSee.R3.2 on the server beams. These new versions support both pseudoColor and true-color devices, plus both old and new detector name conventions. Sent release note to key beamlines users for accessing IDL Virtual Machine (IDLVM) version. Prepared and installed new IDLVM save files for sscan browser and HDF browser.

All the image sub-programs used by the catcher or scanSee have been modified such that a user can flexiblly to view the image either in linear or logarithm color. Requested by Barry Lai from 2-ID-D

HDFB Browser
- Modified to become more powerful and user friendly in previewing image files, the SDS name text field allows the user to specify the name tag to be searched for all the HDF files found in the current directory.
- The "show images" option displays all the images found in the current directory which contains the name tag text field, i.e. a movie of all images found in current directory is displayed. Default name tag 'data' is used which is the image tag name used in CCD Image Server).

Linux/Win32 build
- Successfully built the epics extensions tools with EPICS R3.14.5 on Linux (saturn) and Win32 (on office PC).

Demonstrated IDL visualization tools for Dr. Fajin Yuan of Diamond Light Source Ltd, Rutherford Appleton Laboratory

The extension "SDDS epics" was built on beams with R3.14.5

IDL tools on phoebus/oxygen/helios/saturn were updated to the current release.

Began device driver development for OMS's VME58 replacement; i.e., MAXv.

Began device driver development for Delta Tau's PMAC.

Worked with Steve Shoaf to resolve Newport MM3000 problems in an ASD LINAC diagnostic.

Met with eight developers from the Diamond Light Source controls group. Discussed and demonstrated beamline software and implementation.

Worked with Mark Rivers (CARS-CAT) to diagnose problems in the 4step.db database under Linux and Windows. Mark fixed the first problems: the sseq record was checking the first character of an array <link>.dol.value.pv_link.pvname that didn't exist. I fixed the second problem: recDynLink was clearing a link that had previously been queued for some other action, and that hadn't yet been serviced. The problem is that recDynLinkClear is a two-part operation: the first part involves nulling a pointer and occurs immediately, while the second part is queued for servicing by the task that maintains the link's channel-access connection. When the immediate part happens while a previously issued link action is queued, the nulled pointer eventually causes an access fault. Fixed by adding a lock variable to the recDynLink structure. (This bug has been in recDynLink forever, but under VxWorks it never got exercised.)

Ported array-capable version of save-restore to 3.14, added it to synApps 5.1, and modified the xxx module to execute the new save-restore commands. The only capability that isn't operating-system independent is the NFS-mount stuff.
Modified save-restore to use generic status PV's, so users with custom save sets (i.e., sets other than auto_settings, auto_positions) don't have to make custom database and display files.

Modified the sscan record to acquire from array-valued detectors at the end of a normal scan. Added a new trigger PV (A1PV, and related fields) for arrays that require processing before they can be read.

Changed the handshaking between the sscan record and saveData to take advantage of the sscan record's double buffering of data arrays. This can dramatically improve scan overhead by placing data storage in parallel with data acquisition. In one case, saving 10 1000-element arrays in a 2D scan with a detector dwell time of 50 ms or greater, average scan overhead per data point was reduced from 40 ms to 2.4 ms. At the beamline, where data storage takes roughly five times as long, the improvement will be even greater.

updated std-module documentation, sscanRecord.html and releaseNotice.html, for synApps 4.7.

Diagnosed and fixed a problem in the softMotor database, stemming from a change in EPICS base at 3.13.5. The order of interruptAccept and initialProcess was reversed, which prevents records processed at init time (i.e., by PINI="YES") from using channel access. The softMotor database relies on channel access to program links (this can only be done using channel-access links, because lock sets must be recalculated, and database

links execute under lock-set protection.)

The cleanest way around this seems to be to have database initialization orchestrated by a periodically scanned, PINI="NO", init record (periodic scanning doesn't begin until after interruptAccept). When initialization is complete, the init record sets its own SCAN field to "Passive".

Consulted with Eric Zha (Coordinate Co., Ltd.; evidently a Diamond-light-source subcontractor) on the use of the HP10895 laser-interferometer, which is supported in synApps.

Consulted with Gaspar Pajor (Cosylab) on save_restore for Linux.

Worked on EPICS-training. Attended planning meetings. Created course outlines for the following sessions:
- Database concepts
- Introduction to synApps
- Coordinated Motions
- Run-time programming support
- Scans

John Maclean attended the BioXHIT workshop at he ESRF and gave a presentation entitled "Beamline automation at the APS"

Hardware Database Interface
- Received the Database record EDIT/CREATE application from the Controls Group.
- Started work to integrate it into the BCDA database interface web pages.